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OVERWINTER AND EARLY SEASON VEGETABLE PRODUCTION AND MARKETING

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OVERWINTER AND EARLY SEASON VEGETABLE PRODUCTION AND MARKETING

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This report reflects the opinions of the participants in the seminar but does not reflect the opinions of the Federal and Provincial governments which funded this study.

The author wishes to thank all the speakers who participated in the seminar program namely Messrs. J. Conroy, F. Maurer, M. Sweeney, C. Kempler, J. Alcock and J. Christiansen. The co-operation of Mr. J. Wessel and staff members of the B.C. Federation of Agriculture and the B.C. Agricultural Research and Development Corporation during the planning and delivery stages was also greatly appreciated.

INTRODUCTION

The overwintering and early season production of vegetables in British Columbia has been carried out for many years, however, this production has been mainly limited to the milder coastal regions although overwintering of certain hardy types of onions has been carried out in selected areas of the Okanagan Valley for sometime.

Recently, due to market needs, research has produced many strains of vegetables which are more cold tolerant than their predecessors and certain materials, basically, polyethylene are now being used to provide protection during certain periods of the year.

The thrust of this seminar was to provide information to growers and marketing organizations with this information and also to determine the economic possibilities which may be obtained from this method of production. If economically sound, off season production could make British Columbia more self sufficient in vegetables over a longer period of the year.

PREPARATION PROCEDURES

The writer was contracted in mid-July and consultation followed. The proposal appeared sound and the writer contracted to organize and co-ordinate a seminar.

Early September was the first proposed time, but the writer could not be available before mid-September and the date of September 19 was finally agreed upon.

It was realized from the start that the timing was not ideal since many growers would be busy harvesting their fall crops and attendance would, in all probability, be lower than would have been the case had the seminar been scheduled for late fall or winter. However, availability of funding which was provided from the Agricultural and Rural Development Subsidiary Agreement (ARDSA) made it mandatory that the seminar not be any later in the year than the date selected.

Another possible problem which was noted shortly after the project was started was that the Lower Mainland Horticultural Association (LMHIA) had covered a somewhat similar topic in early February, 1984 at their annual meeting. Many growers attended this meeting and this fact would probably account for a further dilution in numbers registered.

For the next several weeks arrangements were made for speakers, accommodation in which to hold the seminar and miscellaneous equipment. Advertising was done through the B.C. Federation of Agriculture Newsletter and personal contact. There was no problem incurred in securing speakers or making other arrangements although various speakers would have preferred a later date so that the results of their 1984 work could have been reported but this was not a serious problem.

Attached hereto (Appendix A) is a copy of the program which was finally drawn up. A few days before the seminar was to begin the three speakers slated for the morning session indicated that they would prefer to act as a unit, interacting with each other as required. They believed that this approach would result in a more cohesive presentation and provide better coverage of the topics. This indeed proved to be the case and Messrs. Conroy, Sweeney and Maurer are to be complimented since it was very evident that they had spent considerable time together organizing their presentation.

The presentations were well supported with slides which showed the various cultural methods and with tables and other data presented on an overhead projector.

All speakers made admirable presentations and answered questions from the floor in a friendly yet authoritative manner.

HIGHLIGHTS OF PRESENTATIONS

Mr. Jim Conroy
Horticulturist (Vegetables)
B.C. Ministry of Agriculture & Food
Cloverdale, B.C.

Work on extending the vegetable season has been given a top priority and has been accomplished through

1. Early planting
2. Transplanting
3. Overwintering crops

Early planting and overwintering have been made possible through the use of hardier strains or varieties, together with the use of certain protective devices such as -

wind breaks
plastic tunnels
mulches

Earlier transplanting has also been aided through the use of soil blocks, the use of which enables a grower to move plants with little or no root disturbance.

Other areas being investigated are pre germination of seeds and covering the soil with polyethylene for a few days to hasten the warm-up period just prior to seeding.

Mr. Fred Maurer
Vegetable Specialist
Agassiz Research Station

Agassiz has concentrated on extending the season to as close to year round as possible.

Transplants of onions were four weeks ahead of the direct seeded crop.

The yield was increased by 34% and the value by 40%. The earlier you produce a crop the more it usually is worth.

A soil block with a seed in it costs approximately 2¢ and even though the cost per acre is high, the return more than justifies the expense.

Polyethylene, commonly called plastic is now used extensively and the term plasticulture is in common usage.

Large tunnels of polyethylene into which a person can walk are used extensively in the production of year round lettuce. Heat is supplied as needed to keep the temperature a few degrees above freezing.

Mini tunnels which are just a few inches above the crop are also used and it is estimated that there are now 30 acres of tunnels in the Fraser Valley.

Various types of plastic materials are being used. The check plot with no covering utilizes a black plastic needed to control weeds since weedicedes are not too effective early in the season when the soil is cold.

One material which looked very promising is a slitted plastic which protected the plants but did not need opening in the hot weather.

Another material referred to was a floating mulch which was a netted type of plastic which rested on the top of the plants. Some disease problems and some damage occurred with the use of this mulch.

Broccoli grown in Kerilee tunnels (a tunnel manufactured in New Zealand) was harvested as early as May 24th.

Of the crops which have overwintered under normal conditions, cauliflower, cabbage, kale, leeks, onions and carrots have been successful.

Of the overwintering cauliflower, the Dutch varieties are the most successful. Japanese and English varieties are not yet suitable and American varieties are not uniform.

Greatly fluctuating temperatures between day and night during a cold spell are more serious than constant extreme cold.

With cauliflower, the age of transplants when setting out is of prime importance. Four weeks is optimum with five weeks acceptable. Six weeks or longer is not recommended.

Leeks overwinter without any problem. There is a potential for export to the Prairies and Quebec.

Mark Sweeney
Horticulturist (Vegetable process crops)
Abbotsford, B.C.

We are now just getting into off season production on a large scale. The economics are important in relation to California imports.

Indications are that the off season vegetables command a better price and the overall yields are better.

Slides of the following were shown:

1. Floating mulches used in bulbs. Cost $700/acre for material. Required 10 man hours to put in place and 8 man hours to remove. The material is good for 2-3 years if care is taken. Black plastic was used on the ground to control weeds.

2. Slitted plastic - Placed over sweet corn the plastic was slit when the corn started to appear. The corn grew through the slits, weeds were reduced and the soil warmed up by the plastic. The cost per acre was approximately $900 which would raise the price of corn by $1.00 per dozen, thus making this procedure questionable for this particular crop.

3. Mini-Tunnels used for many crops cost approximately $500 per acre for materials plus three man days to apply.

Chaim Kempler
Plant Physiologist
Saanichton Research Station

Reviewed work with cauliflower as observed at Saanichton. Dutch varieties the most suitable. Age of transplants also four or five weeks.

Onions have been successfully overwintered at Saanichton. Seeding in July they will grow without bulbing before winter but will bulb in the Spring. If planted too early they will start to bulb in the fall (small bulbs) which will freeze during the winter. If too late the plants are too small and suffer winter injury. If not seeded in July some bolting to seed may occur before bulbing takes place.

Several tables were shown to illustrate the effect of seeding dates of onions and of transplanting dates of cauliflower in relation to head size.

Jim Alcock
Supervisor, Market Research and Analysis
B.C. Ministry of Agriculture and Food

Producing vegetables out of season presents some exciting possibilities.

Several commodities were discussed as promising possibilities based on Vancouver unloads.

Cauliflower - 4½ lbs. is the annual average consumption in B.C. Availablility of sizes is important. Find out what the market requires and grow a variety to suit.

Broccoli has increased 2½ fold in the last ten years and is number 8 in sales. Competition with Broccoli is not as much of a problem as with cauliflower. It is not a regulated crop.

Colour of the head must be dark green or purplish and it must be iced to retain its quality.

Leeks - 100% of consumption is supplied from May to December. The average price is $12 - $13/30 lb. case. Demand is not increasing but this crop will stand the cold and may be harvested from December to May. The increase must be cautious although the prairies provide a potential market.

Yellow Onions - A high consumption item with strong demand during fall and winter. Consumption is climbing. The May to July market shows a lot of potential and could be supplied by overwintering plants (re Chaim Kempler's presentation). Supplies are shipped in from long distances (i.e. Chile).

Carrots - A high consumption item. The competing area is California. B.C.'s market share is 25% the year round but 65% during our peak production period. Pricing is determined by California. From April - June there is about one dollar per sack increase.

Spinach - A fairly low volume crop, although there has been a substantial increase in demand during the past few years; 70% increase on the Vancouver wholesale market during this period. During our shipping season from April through September there still exists a potential for an increase of 25,000 lbs. per week. Total weekly sales are 100,000 to 125,000 lbs. during November through to April. Much of this could be produced in B.C. California and Texas are the main competing areas.

To sum up - B.C. growers must compete in quality, price and service if success is to be achieved.

John Christiansen
Produce Merchandising Manager,
Canada Safeway

There is room for more vegetable production in British Columbia particularly during periods preceding and following the normal production periods.

Sometimes surpluses occur but usually a solution can be found (yogurt saved the raspberry and strawberry industry).

Market trends are known to the larger firms and they can help to find markets if production is too great for the British Columbia market. Producers must advise the trade well in advance when they have a commodity.

Unfortunately what the farmer perceives and what the consumer perceives as needs are usually somewhat different. The product must suit the consumer. We can expand our agricultural production if the quality is good.

More communication and meetings between extension, farmers and wholesalers are of prime importance.

Comments regarding a few products -

Spinach could be increased in sales.

Parsnips tend to oxidize and discoulour in storage.

Onions - The current status of locally produced onions needs improving and can be accomplished by better quality and grading.

Carrots - Hydrocooling appears to be necessary. Safeway went largely to California last year because of quality even though the price was higher.

Cabbage - Fresh is better direct from the field but is the risk of freezing worth it?

The Canadian Horticultural Council has recently made a survey to determine why products are selling or not selling.

Slogans such as -

Packed with pride by _____ usually encourage the producer to keep his quality up.

The eating quality and promotion determine the success of sales of unusual items (i.e. red onions, purple cauliflower, yellow fleshed potatoes).

Sometimes habits from the home land influence sales of these unusual commodities.

In conclusion -

There must be discipline in production.

A Complete report as submitted by each speaker is attached as Appendix B with the exception of a report from Mr. John Christiansen who did not have a prepared text.

SUMMARY

As expected, attendance was fairly low, particularly at the grower level. Of the 45 persons in attendance 32 were growers, the balance were speakers, representatives of trade organizations or officials of various marketing or government agencies. In addition to the problem areas referred to earlier as possible reasons for low attendance, the weather was ideal and several growers who had registered opted to harvest their crops rather than attend the seminar.

However, what was lacking in numbers was made up by enthusiasm. The interaction between the audience and the speakers was excellent and it was evident that all who attended were very satisfied with the program.

RECOMMENDATIONS

This type of seminar provides an excellent vehicle through which educational data may be provided to growers and others interested, and should be continued.

The timing was not ideal and whenever this situation is apparent some method must be found to make the time constraints more elastic.

CONCLUSION

It is quite evident that there is a strong demand for out of season production of vegetables in British Columbia and every effort should be made to encourage this production and to educate growers on the best methods of producing and marketing these crops.

In this regard the Provincial Government should consider the appointment of a vegetable specialist to further study the culture and marketing of off season vegetable crops. The cost of such an appointment would be relatively small in relation to the hundreds of thousands of dollars which would result from this production once cultural and marketing methods have been established.

Alan E. Littler
Seminar Co-ordinator

APPENDIX A

GENERAL OVERVIEW OF PRESENT PRODUCTION OF OVERWINTER AND EARLY SEASON VEGETABLE CROPS

Jim Conroy - B.C.M.A.F.

OVERWINTER AND EARLY SEASON VEGETABLE PRODUCTION AND MARKETING

J.F. CONROY, P.AG.

Our intention today is to speak on planting for early season harvesting, as outlined in the program, and to also speak on planting for late season harvesting.

The Ministry has, for a number of years, been looking at how farmers might capture more of the market by starting to sell earlier, by selling more throughout the season, and also by selling from short and long-term storage. In short, Extending the Season!

Each year well before the new season starts, Fred Maurer, Mark Sweeney, and I meet to review what was accomplished during the past year and to define our priorities for the coming year. The following overhead shows the different ways of extending the season.

PRIORITIES IN FIELD VEGETABLE TRIAL WORK FOR 1984

I. Extending the Season by:

A. Early Planting — A.R. Maurer

(1) Use of mini-tunnels, floating mulches and surface mulches for early season production of:

(A) cool-season crops
(B) heat-loving crops

B. Use of Transplants — A.R. Maurer & J.F. Conroy

(1) Comparison of celery transplants grown in:

(A) normal flats
vs soil blocks
vs 1.5 cm square acrylic tubes

C. Storage of Cabbage, Carrots, Etc. — P. Perrin & J.F. Conroy

D. Overwintering of Crops — A.R. Maurer
(protectants, spacing and dates of seeding)

(A) Cole Crops - cauliflower
cabbage

(B) Onions, Leeks

Common methods used in the past of getting an early crop have been the use of early varieties, transplants, raised beds or ridges, pre-germinated seed, windbreaks, and walls with a southern exposure to provide radiated heat. In recent times plastic has appeared in many forms; black, clear, slitted, and holed at various densities. Now we have floating mulches which cover the crop, as well as mulches that are in full contact with the soil. An early covering to warm up the soil prior to seeding, will allow radishes, beans, and other crops to be seeded earlier.

We are fortunate, in the main cropping area for fresh vegetables, to have what has been called a maritime climate. The air contains a lot of moisture as it comes in off the ocean and temperatures tend to change slowly, all of which helps provide more even and steady plant growth. The following table provides information on frost data for four locations.

FROST DATA

	SAANICHTON	VANCOUVER AIRPORT	ABBOTSFORD AIRPORT	AGASSIZ
ELEVATION ABOVE SEA LEVEL	200'	16'	198'	50'
FROST FREE DAYS	231	212	170	208
AVERAGE FIRST FROST	NOVEMBER 21	OCTOBER 30	OCTOBER 18	NOVEMBER 7
EARLIEST FALL FROST	OCTOBER 25	OCTOBER 2	SEPTEMBER 15	SEPTEMBER 7
AVERAGE LAST FROST	APRIL 3	MARCH 31	APRIL 30	APRIL 12
LATEST SPRING FROST	MAY 10	APRIL 30	MAY 28	MAY 24

SOURCE: FROST DATA 1941-1971
ATMOSPHERIC ENVIRONMENT SERVICE
ENVIRONMENT CANADA

One thing that may not get much mention today is weed control. Yet, without reasonable control, there is no point in investing time and money in what will turn out to be a disaster. Following a rotation, in which herbicides can be used for some crops in the rotation, will help get rid of certain kinds of weeds. Fumigating at recommended rates and methods for weed control, ahead of planting, will usually give good control. The use of black plastic in good contact with the soil will also provide good control. With overwintered crops, chickweed and grassy weeds such as rye and bluegrass are likely to be a problem.

I propose to stop here. Fred Maurer and Mark Sweeney will be speaking on management and field trials to do with extending the season. If you have any questions at this time, I will do my best to answer them.

OVER-WINTER CAULIFLOWER

J.F. CONROY, P.AG.

Vancouver Island was the original home of over-wintered crops. By 1978 acreage had shrunk to almost nothing; the most suitable area (Gordonhead) had been lost to housing. On the Lower Mainland none was being grown at all.

In 1978/79 the Reynolds family put in a trial planting of overwintered cauliflower on their farm in Delta and the B.C. Ministry of Agriculture and Food put out the first variety trial in the same field. The trial included varieties from overseas.

In each of the following years, transplants of promising varieties from Europe were grown at the Canada Research Station, Agassiz, B.C. for planting out by Agriculture Canada at Agassiz and Abbotsford, and by the B.C. Ministry of Agriculture and Food at Delta. These trials included three times of planting. As each year showed an increase in yield for the earliest planting, the recommended date for the earliest transplanting became the 6th of August. However, one has to remember that the years previous to the winter of 1983/84 did not have the severe drops in temperature that were experienced in December 1983 and January 1984.

Work on varieties and times of planting is considered complete for the moment. However, work on spacing and fertility still needs to be done locally.

From 1979 to 1984 there has been increased interest in the over-wintering of crops. The acreage has increased in the Lower Mainland from none in 1978 to 65 acres in 1983 and on Vancouver Island from 5 acres to 15acres, for a total of 80 acres in British Columbia.

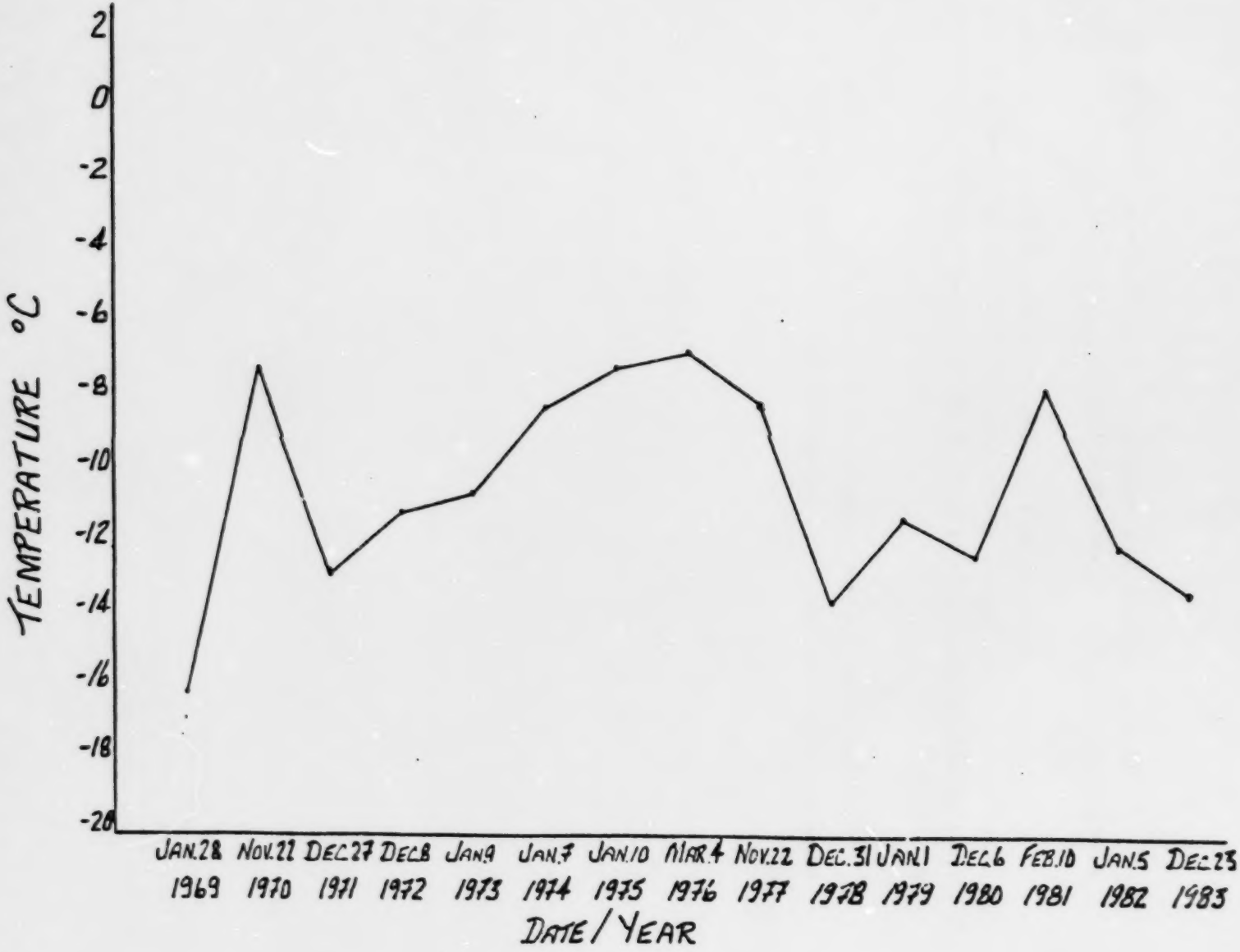
While some growers are doing a good job, many are ordering their seed too late or leaving the seeding until too late. As a result, plants go into the winter too small, and in the spring are not able to make up for the poor start in the fall.

Ideally, seeding in a nursery should be done early enough in July to enable transplanting to be done in mid-August.

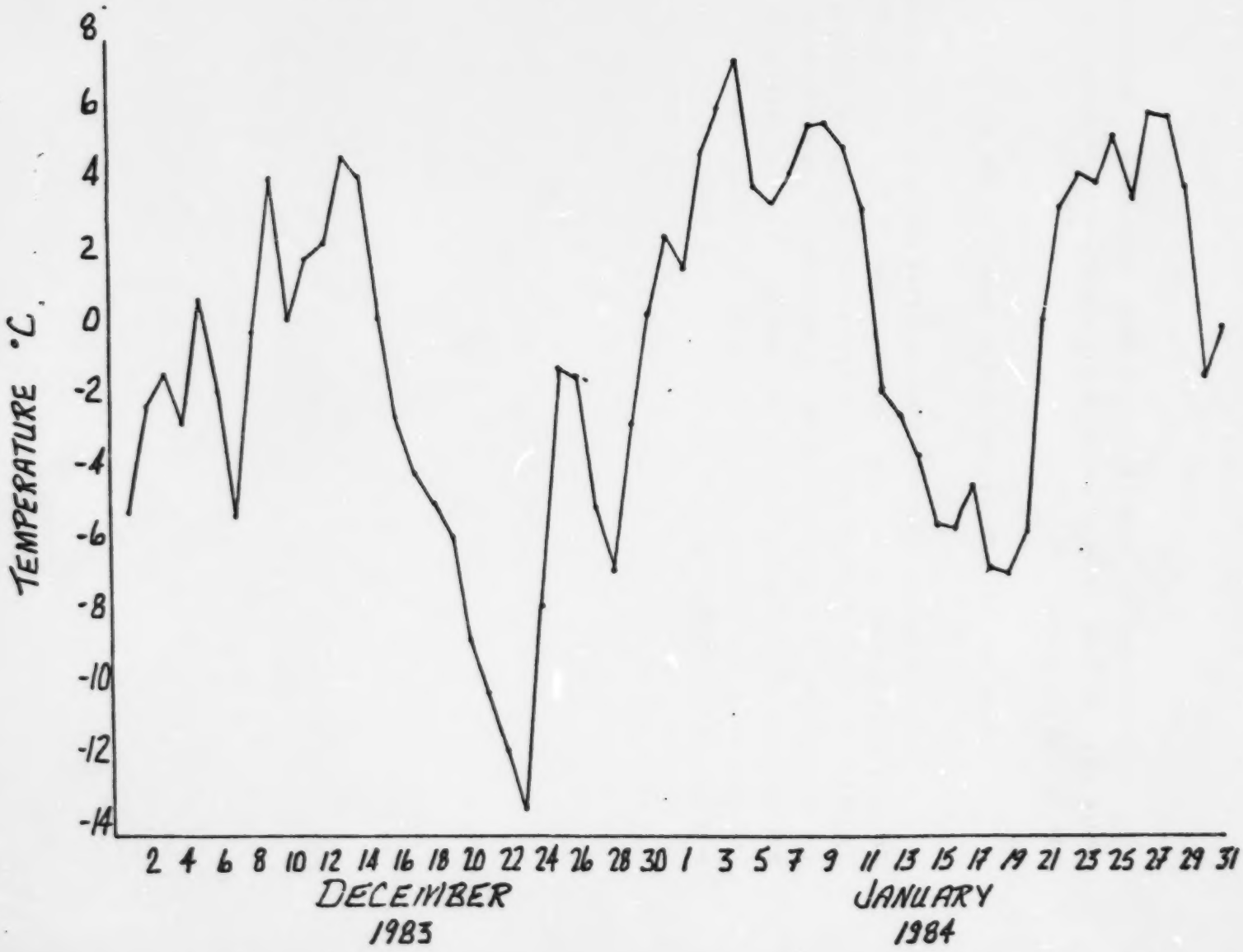
The first real set-back to over-wintered cauliflower occurred this past winter (1983/84) when a severe frost at Christmas and a second severe frost in mid-January destroyed most of the plantings in British Columbia and Washington.

The annual mimimum temperatures for 1969-1983 and the daily temperatures for December 1983 and January 1984 are shown as follows:

ANNUAL MINIMUM TEMPERATURES 1969-83
VANCOUVER INTERNATIONAL AIRPORT



TEMPERATURE FLUCTUATIONS DURING DECEMBER '83 & JANUARY '84
VANCOUVER INTERNATIONAL AIRPORT



Competition for sales is from the Mount Vernon area of Washington, where about 600 acres is being grown, and from all-year-round production of the crop in California.

Prices are very volatile and tend to drop after mid-April.

A fair amount of information has been made available through the Grower's Short Course, Grower Notes, and Field Days. A list of these is appended. In addition, Fred Maurer with Agriculture Canada, Mark Sweeney with the B.C. Ministry of Agriculture and Food at Abbotsford, and myself with the B.C. Ministry of Agriculture and Food at Cloverdale have been readily available to provide answers to most, if not all, questions on the over-wintered cauliflower crop.

RESEARCH AND EXTENSION ON OVER-WINTERED CAULIFLOWER

1979	1978/79 Overwintering cauliflower and cabbage variety trials - B. Wisbey
Feb. 1981	Overwintered cauliflower for coastal British Columbia - Maurer, Conroy, and Templer
1981	Overwintered cauliflower for British Columbia - A.R. Maurer
June 1981	Overwintered cauliflower (repeat of above) - Grower Notes, Mark Sweeney
Oct. 1981	Vegetable growers meeting at Cloverdale - J. Conroy
Feb. 1982	Overwintering of leeks and cauliflower in coastal British Columbia - A.R. Maurer
1982	Overwintering cauliflower - Res. Hilights, Saanichton
Apr. 1982	Local farmers miss out on cauliflowers - The Province
June 1982	Technical Report #8 - Overwintering cauliflower in B.C. - A.R. Maurer
June 1982	Report on 1981/82 overwintering cauliflower variety and times of planting trials done at Delta, B.C. - J. Conroy
Oct. 1982	Field Day for growers of overwintering cauliflower - J. Conroy
Feb. 1983	Effect of seeding time on performance of overwintered cauliflower - A.R. Maurer
Apr. 1983	Field Day for growers of overwintering cauliflower - J. Conroy
1983	Response of four winter cauliflower cultivars to seeding dates - A.R. Maurer
Feb. 1984	When do you seed winter vegetables? - A.R. Maurer
Mar. 1984	Winter Cauliflower - talk at Grower's Short Course, Vancouver Island - J. Conroy

APPENDIX B

VEGETABLE SEASON EXTENSION IN COASTAL BRITISH COLUMBIA

A.R. Maurer - Agassiz Research Station

VEGETABLE SEASON EXTENSION IN COASTAL BRITISH COLUMBIA

A.R. Maurer - Agassiz Research Station

For Presentation at the ARDCORP Vegetable Seminar

September, 1984

I. Early Season Production

The research program at Agassiz has concentrated on extending the normal season of production of vegetables. This goal has been tackled in several ways. In the first instance, we worked on providing early and late season crops by the use of transplants. We showed that a crop like Broccoli could be produced from early June to the first heavy frost in November or December.

With onions, we demonstrated that by the use of transplants, started in soil blocks, we could produce a marketable crop as much as four weeks ahead of a direct seeded crop and two weeks ahead of bare root transplants. Our results showed that onions started in soil blocks were not only earlier but yielded a greater quantity of onions which were larger in size.

In trials conducted at Cloverdale from 1977-1980, we showed that block transplants increased yields by as much as 34% and dollar value by up to 40%. This increased value of $1270.00 per acre would offset the cost of soil blocks and still leave a good margin of profit.

TABLE 1. Response of onions to transplanting of soil-block seedlings vs direct seeding. Trial at Cloverdale - 1977.

Transplants		Direct Seeding		% Increase	
Yield	Value	Yield	Value	%	%
T/A 31	$/A 4,440	T/A 23	$/A 3,170	T/A 34	T/A 40

* Mean of three varieties. Direct Seeding was done on the same date as transplanting.

TABLE 2. Yield, value per acre for September and October and number of days to harvest for onions started in soil blocks, bare root transplants and direct seeded. Cloverdale - 1979.

	Yield	Value		Days to Harvest	Harvest Date
	T/A	September $/A	October $/A	#	
Soil Block	35.4	6,070	4,463	75	July 17
Bare Root	32.0	5,747	4,153	92	Aug. 3
Direct Seeded	23.2	3,985	2,922	102	Aug. 13

Production of vegetables early in the season can also be accomplished by the use of protective coverings. There are now so many materials and systems using plastics of one type or another that the term "Plasticulture" has been coined to cover them all.

In our work at Agassiz, we have taken two approaches. We have two large or "maxi" tunnels which are used for year-round vegetable production. These tunnels differ from greenhouses in that they are not heated above 10°C and the plants grow in the native soil not on benches or in containers.

These large tunnels come in a variety of sizes, can be single or double skinned, heated or not heated, movable or permanently placed and can be covered with several types of plastics. Such tunnels are used extensively in many parts of the world and their use is rapidly expanding in British Columbia.

The small or "mini" tunnels are also widely used all over the world. These "row covers" also vary in shape and size and in type of covering material.

At Agassiz, we are presently testing three types of mini tunnels and two floating mulches. In 1984, we had two trials using the following materials:

1. Black Plastic Mulch (BPM)
2. BPM + New Zealand Kerilea tunnel
3. BPM + Slitted Plastic tunnel
4. BPM + REEMAY tunnel
5. BPM + XIRO slitted plastic floating mulch
6. BPM + REEMAY floating mulch

These materials are all available in Canada and can be described as follows:

1. Black plastic mulch. Usually 1.5 mil thickness. Made of commercial black polyethylene. Available in different widths if an order is placed well ahead of the required time. If not available, you can cut your own from wide rolls. Our mulch applicator takes rolls 4 feet wide, but I would recommend at least 5 feet wide rolls.

2. The Kerilea tunnels from New Zealand have a patented hoop made of galvanized iron in a W shape. Patented wire clips lay over the hoops and "clip" on easily. There is no need to bury the plastic at the sides of the tunnels. Kerilea tunnels may be covered with any material but the manufacturer supplies a tough plastic which is photodegradable.

3. The slitted plastic tunnels are entirely home made. Heavy wire is shaped to provide hoops which, when buried, will be 1 m wide and 50 cm high. The hoops have small loops on either side which lie at ground level. These loops are used to tie the plastic down. The sides of the plastic are covered with soil. The plastic is slitted on both sides, about 15 cm from the peak. Slits are about 2 cm apart and 13 cm long. These slits should be cut before the plastic is unrolled. Pre-slitted plastic can be purchased at twice the price of the other.

4. The Reemay tunnel we used consists of Kerilea hoops covered with spun bonded polyester. This spun bonded material is sold in Europe as "Growtect." There are many types, some being made of spun bonded polypropylene. These plastics allow air and water to pass through them.

5. XIRO is a patented polyethylene material from Switzerland. The plastic is perforated with small slits and has the appearance of expanded metal. The material is placed right over a crop, without supports and expands as the crop grows. It can go over direct seeded or transplanted crops.

6 REEMAY floating mulch. The same material as in 4 above but laid loosely over a crop. Unlike Xiro, it does not expand and has to be lifted as soon as it presses down on the plants.

We have not tested all the available materials. There are many types of floating mulches which consist of punched polyethylene. The size of holes and number of holes per square meter varies. These punched plastics can also be used for mini tunnels, but care must be taken in selecting the right one.

Care must also be taken in deciding when to apply polyethylene to a crop. Polyethylene encourages outgoing radiation from the soil. In Europe they have recorded lower night temperatures in a polyethylene covered tunnel than in an adjoining uncovered plot.

Our two replicated experiments tested the following crops.

Early Trial:

a) Lettuce

b) Broccoli

c) Zucchini

Later Trial:

a) Tomatoes

b) Peppers

c) Cantaloupes

We are still harvesting some of the crops but some comments can be made at this time.

Broccoli, lettuce and zucchini were seeded on February 27 into soil blocks in a greenhouse and transplanted to the field on April 4 to 6.

All protective covers were removed from broccoli and lettuce on May 17 and from zucchini on May 29.

Soil Temperature

All protective coverings raised the soil temperature at 5 and 10 cm above that of the BPM control. The highest temperatures were found under the Xiro treatment, followed by the Slitted Plastic tunnel. The least differences were found in the Kerilea and Reemay tunnels.

Air temperature was highest in the Kerilea tunnel, followed by the slitted plastic tunnel. The Reemay tunnel had the least effect on air temperature due to the porous nature of the material.

Light transmittance was measured on sunny and cloudy days. The slitted plastic and Reemay transmitted 73% of the photosynthetic active radiation on cloudy days and 83% on sunny days. The Kerilea tunnel had reduced transmittance, the values being 57% and 76% respectively. This was due partly to condensation forming on the inside of the tunnels and partly to the heavier consistency of the plastic.

Earliness and Yield

The Kerilea tunnel had the earliest harvest of broccoli (May 24 to June 4). The next earliest were the slitted plastic tunnel and the Reemay floating mulch. The latest harvests came from the Reemay tunnel and the BPM control.

The largest heads and greatest yields came from the slitted tunnel and the BPM.

Lettuce harvest was earliest in the Kerilea tunnel, slitted plastic tunnel and Xiro treatments and latest in the BPM control. The main cutting taking placing between June 4 and 6 for the early harvest and June 13 to 21 for the heads in the control treatment.

The floating mulches damaged some plants and reduced total yield. Head size was smaller in the BPM control plot than in any other treatment.

Zucchini plants grown without protection did not perform satisfactorily; only one out of 15 plants survived. The surviving control plant came into bearing five weeks after those in the Kerilea and slitted tunnels (July 8 against June 1). The Kerilea tunnel was ahead in earlieness from June 1 to June 21, after this period all treatments except the control yield equally. The plants are still producing today.

The second trial with peppers, tomatoes and cantaloupes is still being harvested and no data are available at this time.

II Late Season Production

In one tunnel trial at Abbotsford we have replaced the Kerilea tunnels over peppers but it is too early to say what the results will be.

Late season production of leeks, cauliflower, cabbage and broccoli has been demonstrated at various times over the past few years. One of the most promising crop is leeks. By choosing the right varieties and planting at the right time, leeks can be harvested from August to the following May. Cauliflower and Cabbage may also be harvested up to Christmas.

III Over-Wintering Crops in the Field

The program at Agassiz has, over the past few years, tried out a number of different vegetable crops in the season extension program. These include:

Winter Cauliflower

Winter hardy onions

Winter hardy leeks

Carrots

Cabbage, Red and White

Brussels Sprouts

Lettuce (winter hardy)

Peas

Kale

Chicory

We have met with success with the following:

Cauliflower

Leeks

Onions

Carrots

Kale

Each of these crops has to be handled differently.

Winter Cauliflower

There are several types of winter cauliflower available. We have tested English, French, Japanese, American and Dutch varieties. The best suited type for our Lower Mainland climate are those derived from the Walcheren Winter group. The French varieties from Roscoff are not really winter hardy; most of the British varieties tested are of inferior quality; the American varieties are equally unsuited and the Japanese varieties mature very quickly and can only be harvested in a winter without heavy frosts.

Time of Seeding is highly critical. If started too early plants become too large by the onset of winter and are more susceptible to freezing than those planted later. Seeding after the first of August leads to small plants which will produce small unmarketable heads. The optimum date for seeding in the Lower Mainland is mid July.

Method of Seeding is also critical. Direct seeding in the field should be done in early July. At this time soil conditions for germination are poor which leads to unsatisfactory establishment. The use of bare root transplants also retards plant development and encourages the spread of diseases such as club root.

We recommend the use of soil blocks, speedling trays or other seedling containers. Pre-seeded soil blocks are available commercially.

Plant spacing - We have trials under way to determine optimum spacing. Good results were obtained at between-row spacings of 90 to 107 cm and within-row spacings of 33 to 38 cm. Close spacing provides more mutual plant protection from winter winds than does wide spacing.

Cold Tolerance - Very early frosts in November or December can cause more damage to crops than later frosts but we cannot predict how plants will react to any given set of climatic conditions. In 1983-84 frosts in late December and early January, which were interpersed with mild temperatures and rain, completely devastated the cauliflower in Delta. At Abbotsford, survival was good although plants were decimated (10% reduction). At Agassiz, survival ranged between 4% and 96%, depending on variety. The Walcheren types averaged 80% survival.

In our trials we have had good survival after exposure to -19°C, with a cover of snow. Without snow we have had good survival at -15°C.

Crop Protection with wind barriers and covering plastics is common in Europe. At Agassiz, the use of Growtect as a frost protectant was disastrous. The uncovered plots yielded better than the covered plots. The Growtect literally rubbed the plants to death.

Waterlogging must be avoided. Cauliflower will simply not survive standing water. Soil must be well drained.

Varieties recommended are as follows:

Armado Quick (small heads) - earliest

Armado April

Armado May

Armado Tardo

Armado Clio

Arminda - latest

Inca

Fertilizer needs are not known in B.C. but it is essential that plants be not too big or too lush when they go into winter. Avoid too much nitrogen in the fall.

We are presently studying the effects of 1, 100, 200 and 300 lb N/acre applied as top dressing in spring.

Age of Seedlings is very critical. Transplants should be no more than five weeks old and preferably 4 weeks old. Six and 7 week old seedlings produce poor plants with poor heads.

Leeks

Leeks can be harvested from September to the end of April in British Columbia but care must be taken in selecting the right varieties. Most varieties available in Canada and the U.S.A. are not winter-hardy.

In general, leeks can be divided into three groups. The early maturing, or Fall Group is not frost tolerant and should be harvested by the end of October. The Winter Group can stand some frost but should be harvested by the end of December. The Spring Group is winter-hardy and may be harvested from February to April.

Varieties which fit into these groups include the following:

Fall Group: Colonna
Odin
Kilima
Longa (for processing only)
Unique

Winter Group: Jolant
Winter King
Giant Winter
Goliath
Winta

Spring Group: Alaska
Artico
Acadian
Derrick
Blizzard
Olaf

Date of Seeding can be a critical factor in leek production. Varieties for late summer and fall harvesting should be started indoors in mid February to early March. Those destined for harvest before Christmas should be seeded indoors in March to mid April. For overwintering seeding should be scheduled from mid April to mid May. Seeding in June and July is not recommended. Plants will survive the winter when planted that late but June seeding will lead to small, thin shafts while seeding in July will produce bolters.

Method of Seeding

Leeks can be seeded thickly in flats and transplanted as bare root seedlings, the poorer seedlings being discarded. Good results can also be obtained by seeding in soil blocks but cost will be greater.

Method of Transplanting

We recommend transplanting into a trench 15 to 20 cm deep. Leeks can also be dropped into individual holes punched into the ground. When the latter method is used, the seedlings are simply dropped into the holes without tamping or filling of the hole. Rows should be 90 cm apart and spacing within rows should be 8 to 10 cm.

Transplanting can be done when plants are six to eight weeks old.

Canadian Requirements for leeks are in the 5 million lb range. Of this quantity 2.8 million lb were produced in Canada and the balance was imported (1982 statistics).

The main markets for leeks are as follows (in thousands of lb).

	Domestic	Imported	Total	% Domestic
Montreal	1758	633	2391	74
Toronto	210	549	759	28
Vancouver	347	243	590	59
Quebec City	362	25	387	94
Ottawa	143	100	243	59
Calgary	0	157	157	0
Edmonton	0	125	125	0
Totals	2820	1832	4652	61

Imports originate mostly in the United States but some are imported from France for the Quebec markets (Bisaillon, 1982).

When compared to some of the other vegetables which could be classified as specialty crops, leeks appear to be fairly well accepted on some Canadian markets. A few of these crops are listed below (in thousands of lb consumed).

Crop	Domestic	Imported	Total
Artichoke	0	2736	2736
Asparagus	705	3851	4556
Brussels Sprouts	2587	5785	8372
Garlic	2	4474	4476
Parsley	1457	4392	5849
Parsnip	5388	962	6350
Rhubarb	569	115	684
Zucchini	1993	8933	10926
Witloof	341	418	759
Leek	2853	1918	4771

The potential for expansion of production of leeks lies in exploiting existing markets and in establishing new ones. The provinces of Manitoba and Saskatchewan do not presently consume any appreciable quantities of leeks but Alberta's consumption has gone from 101,000 lb in 1977 to 282,000 lb in 1982.

Monthly consumption figures for 1977 and 1982 for the 12 markets reported by Agriculture Canada (Anonymous 1978, 1983) show that the majority of imports occur between the months of January and June (Figure 1). This is a period when leeks from British Columbia could fill the gap. Winter maturing leeks can be harvested in December and over-wintered leeks can be harvested from February to May. Storage of leeks for periods of up to 2 months is feasible. B.C. can also produce leeks which mature from July to October but the market would have to be expanded for these leeks to be absorbed.

Clearly there is a worthwhile potential for production of over-wintered leeks in British Columbia.

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Over Wintered Onions

The production of over-wintered onions was common in the interior of B.C. but the industry there has declined.

Experiments have been conducted at Agassiz since 1977 to determine the feasibility of production at the coast. In our first attempts we direct seeded the crop and found that with freezing and thawing, onion seedlings heaved and were left on the surface of the ground. In our next attempt we used bare root transplants and again did not meet with success.

In our third attempt we transplanted onions started in soil blocks and were able to produce a crop.

Date of seeding is highly critical. When we compared seeding into soil blocks on July 16 and August 1, we found that the earlier date led to almost complete bolting while the second date produced a marketable crop.

Japanese varieties of over-wintering onions are being grown in many areas of the world and some of them are worth considering in British Columbia. There are, however, many other varieties which we should consider. Some of our best yielding lines came from an American seed company which, unfortunately, no longer produces them.

In 1983-84 we grew the following varieties at Agassiz and Jim Conroy grew the same ones at Westham Island from seedlings started at Agassiz:

Winter White Bunching

Sweet Winter P.V.P.

Senshyu

Avanti

Winter Hardy

Willamette Sweet

They were seeded on August 4 and transplanted on August 30, 1983 and harvested on July 5, 1984.

At Agassiz, the best yields were obtained from Willamette Sweet, Sweet Winter and Avanti. The percentage of bolters ranged from 9% for Willamette Sweet to 67% for Winter Hardy.

In 1984-85, we have three trials under way at Agassiz and seedlings have been supplied to the Saanichton Research Station and BCMAF for other trials.

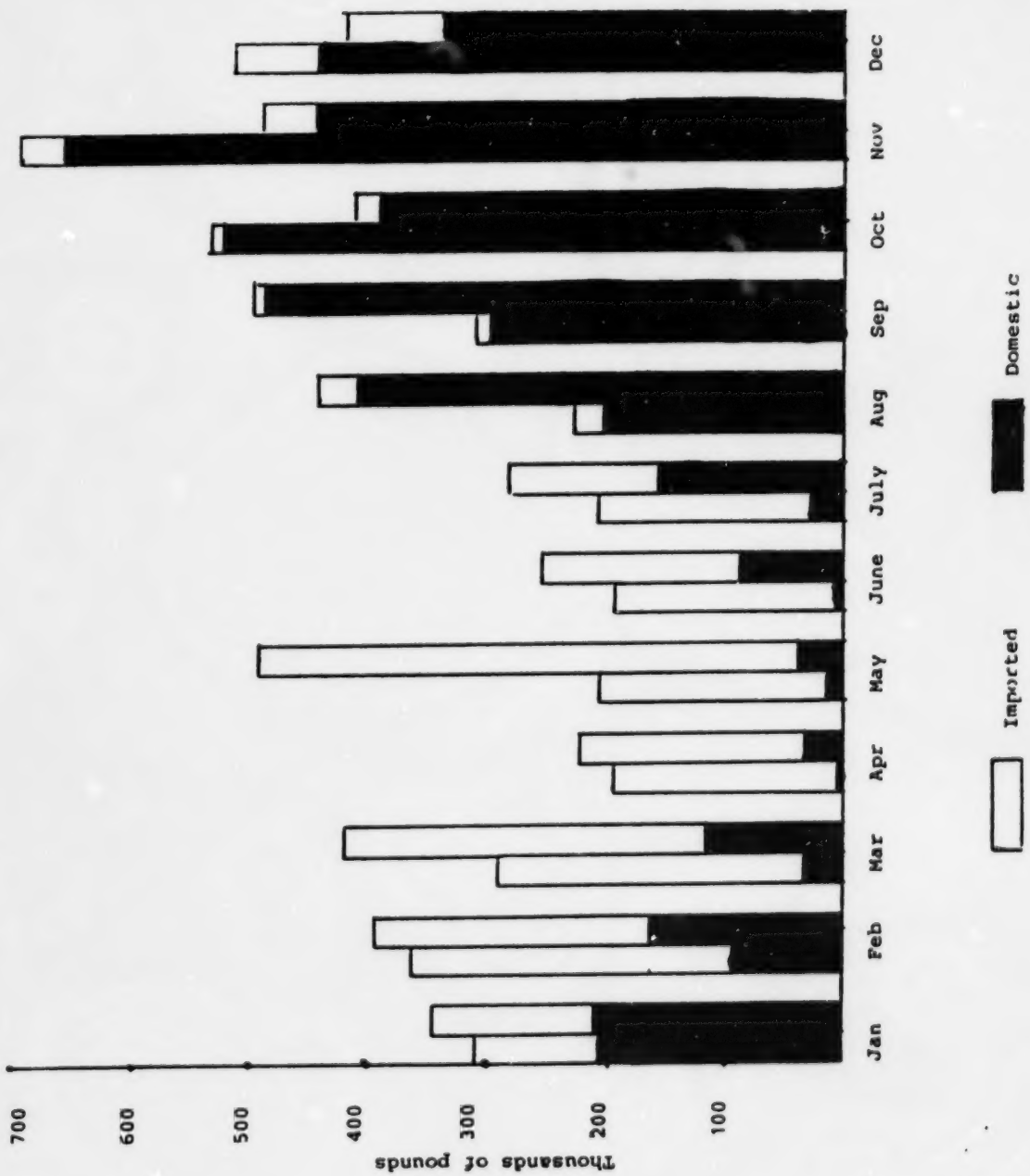
The Agassiz trials consist of the following:

1. Dates of Seeding. Two varieties, Sweet Winter P.V.P. and Walla Walla were seeded on August 3, 17 and 31. Transplanting to be done 4-5 weeks later.

2. Density and Spacing. One variety, Willamette Sweet, seeded into soil blocks at 1, 2 and 3 seeds per block, and blocks spaced in the field at 10, 15 and 20 cm. Between-row spacing at 45 cm. Seeding was done on August 15, 1984.

3. A replicated trial of 10 varieties was seeded on August 13 and transplanted to the field on September 12, 1984.

Yearly Canadian Consumption of Leeks for 1977 and 1982, showing Imported and Domestic Supplies in Thousands of Pounds for Each Month



APPENDIX C

USE OF TUNNELS AND MULCHES TO ADVANCE EARLINESS IN VEGETABLE CROPS

Mark Sweeney
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B.C. Ministry of Agriculture and Food
Abbotsford

USE OF TUNNELS AND MULCHES TO ADVANCE EARLINESS IN VEGETABLE CROPS

by

Mark Sweeney
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In many countries, plastics have been used in vegetable production to advance earliness since the 1950's and 60's. In B.C. use has been limited, but interest has increased greatly in the last few years.

To justify the extra cost and risk of growing early season vegetables under plastic, there must be an economic benefit through:

a) harvesting a crop before the traditional local season and therefore capturing a premium price. With many crops (i.e., cauliflower, broccoli) however a two-three week earlier harvest does not necessarily mean a price advantage because of year-round competition from California.

and/or

b) a higher total yield because of a longer harvest season (i.e., cucumbers, zucchini).

Some growers feel they can justify the extra expense just by getting on the market earlier and being able to sell products for an extra two weeks. Also, being in early helps to set up contacts for main season marketing.

Growers should carefully assess the risks, costs and the market for each crop before undertaking this form of culture.

Floating Mulches

Definition - perforated clear plastic mulch applied after seeding or planting. The mulch is lifted up and supported by the crop as it grows. Achieves the same result as a tunnel or row cover, but without the hoops.

Perforations are necessary to:

- prevent ponding of rainwater
- prevent too high temperatures
- lessen wind suction
- allow air movement - gas exchange

These mulches are widely used in Europe on many vegetable crops including early potatoes, lettuce, spinach, carrots, cabbage and are reported to advance maturity from 10-20 days.

Types of Mulches

a) Perforated with holes - 5% of area (Dutch)

- available in large sheets 10 m x 100 m long
- rolled out by hand after planting and anchored with shovelfuls of soil
- used in B.C. by one bulb grower
  - . advances cut tulips by 7-10 days
  - . advances cut gladiolias by 10-14 days

Cost
- $700/acre for material (will last for two seasons)
- 10 man hours per acre to lay
- 8 man hours per acre to remove

This type of perforated mulch is also available in 5-6 ft. wide strips. It can then be laid by machine to save labour and the amount of plastic used per acre can be reduced (i.e., only

beds or rows are covered). With this method, however, there can be greater crop loss due to distortion as the crop pushes against the taut edges of the mulch.

Removal Time

Removal time is critical and will vary with the crop, the season and type of mulch used. It may range from 3-7 weeks after application. If left on too long, crop yield is greatly reduced.

Weed Control

Weed control is a limiting factor for many crops. Only crops where a good pre-emergence residual herbicide is available should be considered for this culture, or with some crops black plastic mulch can be used. Weeds do very well under plastic.

Other Types of Mulch

Reemay - spun bonded polyester material
- "breathes" more than plastic mulches
- does not let in as much light
- does not promote growth as well as plastic materials

Cost: $430 per 2550' x 5.6' roll (can get at least two seasons' use)

Xiro - slitted plastic mulch (Swiss)
- slits open up as crop pushes up plastic
- advances growth much better than Reemay

Cost: $103 per 830' x 7.2' roll (narrower widths are available)

- tears very readily and cannot be re-used.

1984 Trial Results with Reemay and Xiro

Sweet Corn

- seeded May 1, immediately covered with Xiro
- plastic was slit to allow corn through when plants became distorted against mulch
- harvest was advanced by about 10 days
- cheaper mulch materials are available which would be more economical for lower value crops such as corn

Cauliflower

- Reemay and Xiro were applied to a field transplanted on March 28
- mulches were removed 2 weeks later in order to apply root maggot sprays
- Xiro advanced harvest by 7-10 days
- Reemay advanced harvest by only a couple of days
- use of plastic does not appear to be justified on cauliflower as price at this early harvest was lower than the main season price

Rhubarb

- Reemay and Xiro were applied to a commercial rhubarb field on March 2
- lots of slack was left to allow for crop growth
- mulch was removed on March 22
  - Xiro - had double the growth of the control
    - sufficient stalk length to begin harvest
  - Reemay - only slight advancement in growth

Cucumbers/Zucchini

- Reemay and Xiro were compared to plastic tunnels in commercial cucumber and zucchini fields

- 4 ft. wide black plastic mulch was laid by machine
- zucchini and cucumber transplants were planted through the mulch on May 1
- the commercial field was covered with perforated plastic tunnels over hoops, small plots of Reemay and Xiro were also applied
- covers were removed about 1 month after planting

Zucchini - harvesting in the tunneled crop began mid-June, the plot covered with Xiro was a few days behind while the plot covered with Reemay was a couple of weeks later - not much ahead of the uncovered control

Cucumbers - transplants were too old and did not establish well so results are questionable. Xiro seems to advance growth similar to the tunnels - Reemay was much behind

Costs (approximate)

- tunnel culture (black plastic, hoops, tunnel plastic) - $500.00/acre + labour
- Reemay (+ black plastic) - $1,350.00 + labour
- Xiro (+ black plastic) - $900.00 + labour

Labour costs for Reemay and Xiro should be considerably less as the application is more readily mechanized. Consideration must also be given to whether or not material can be reused - tunnel poly and Reemay should last at least 2 seasons, Xiro cannot be reused.

Tunnel culture appears to be the most effective and economic method of advancing earliness in vine crops. At current prices, cost of Xiro and Reemay is prohibitive.

Summary

There is some potential for vegetable growers to extend their marketing season by using plastic tunnels and mulches. A wide range of materials and methods are available with considerable variation in effectiveness, cost and durability. Careful consideration must be given to the market potential and prices on each crop and the costs and effectiveness of the available technology.

APPENDIX D

AN OVERVIEW OF WORK DONE AT SAANICHTON RESEARCH STATION ON OVERWINTERING CAULIFLOWER AND ONIONS, INCLUDING A BRIEF STATEMENT ON THE PHYSIOLOGY OF PLANTS AS IT AFFECTS COLD TOLERANCE

Prepared by:

Chaim Kempler
Plant Physiologist
Saanichton Research Station

EFFECT OF SEEDING DATE ON OVERWINTERED CAULIFLOWER PRODUCTION (79/80)

Seeded	Planted	% Survival	Yield Kg/10 m^2	Number of Heads 10 m^2	Av. Head Size (g)
July 16	Sept. 13	93	15.6	26.6	586
Aug. 1	Sept. 21	88	11.6	25.3	457

EFFECT OF SEEDING DATE ON YIELD OF OVERWINTER CAULIFLOWER (80/81)

Cultivars	Harvest	Seeded / Planted	YIELD Kg/10 m² 18/7 28/8	28.7 11/9	7/8 26/9
ROSCOFF #20	March		11.4	14.1	4.4
ROSCOFF #30	March		12.9	15.9	4.9
ARMADO QUICK	March		11.3	12.9	2.3
MARKANTA	April		17.5	14.5	8.9
BIRCHINGTON	April		14.5	17.7	8.7
MARCH PAST	April		11.8	15.6	10.7
ARMINDA 370	May		19.7	21.5	11.0
LATE ADONIS	May		18.2	20.1	10.4
MAYA	May		18.1	18.8	15.0

EFFECT OF SEEDING DATE ON HEAD SIZE OF OVERWINTER CAULIFLOWER (80/81)

Cultivars	Harvest	Seeded / Planted	HEAD SIZE (gr) 18/7 28/8	28/7 11/9	7/8 26/9
ROSCOFF #20	March		481	498	301
ROSCOFF #30	March		545	546	256
ARMADO QUICK	March		495	442	210
MARKANTA	April		619	613	375
BIRCHINGTON	April		562	646	382
MARCH PAST	April		563	570	405
ARMINDA 370	May		745	762	448
LATE ADONIS	May		624	737	425
MAYA	May		642	628	531

EFFECT OF PLANTING DATE ON YIELD OF OVERWINTER CAULIFLOWER (81/82)

Cultivars	Seeded Planted	YIELD Kg/10 m^2 15/7 19/8	30/7 3/9
ARMADO QUICK		17.7	12.1
HERALDA		19.5	10.8
ARMADO APRIL		20.6	14.0
MARCH PAST		23.7	15.3
ARMADO MAY		18.2	13.7
ARMINDA		26.3	10.6
MARKANTA		20.6	12.9
BIRCHINGTON		23.8	15.9
LATE ADONIS		22.3	15.8
NEW LATE ADONIS		20.0	12.8
MAYA		21.5	12.5
MAYSTAR		20.1	14.4
MEAN YIELD		21.2a	13.4b

YIELD AND HEAD SIZE OF OVERWINTER CAULIFLOWER (81/82)

Cultivars	Harvest	Yield kg/10 m^2	Head Size (gr)
ARMADO QUICK	April	14.9	608 d
HERALDA	April	15.1	620 cd
ARMADO APRIL	April	17.3	726 abc
MARCH PAST	April	19.5	789 ab
ARMADO MAY	Early May	15.9	760 abc
ARMINDA	Early May	18.4	984 a
MARKANTA	Early May	16.7	802 ab
BIRCHINGTON	Early May	19.8	841 ab
LATE ADONIS	May	19.0	834 ab
NEW LATE ADONIS	May	16.4	697 bcd
MAYA	May	17.0	768 abc
MAYSTAR	May	17.2	711 bcd
EARLY PLANTING		21.2 a	912 a
LATE PLANTING		13.4 b	611 b

MAIN HARVESTING DATE FOR EARLY AND LATE CAULIFLOWER PLANTING (81/82)

	DATE	
	EARLY	LATE
ARMADO QUICK	24/4	30/4
HERALDA	25/4	30/4
ARMADO APRIL	26/4	3/5
MARCH PAST	30/4	2/5
ARMADO MAY	6/5	8/5
ARMINDA	8/5	14/5
MARKANTA	9/5	9/5
BIRCHINGTON	9/5	11/5
LATE ADONIS	15/5	16/5
NEW LATE ADONIS	19/5	19/5
MAYA	19/5	21/5
MAYSTAR	19/5	21/5

EARLY	S-15/7	P-19/8
LATE	S-30/7	P- 3/9

EFFECT OF DIFFERENT SEEDING DATES ON WINTER ONION PRODUCTION (79/80)

	Seeded July 16/79			Seeded Aug. 1/79		
Cultivars	Number Surviving	Bolters (%)	Marketable Yield Kg/3 m Row	Number Surviving	Bolters (%)	Marketable Yield Kg/3 m Row
EXP-781	15	0	0.35	77	0	6.42
EXP-782	22	27	0.52	72	17	7.52
Keepwell	32	0	2.15	78	0	5.82
Tropic Ace	36	0	2.62	43	8	7.45
Kas Tis Ke	22	0	0.60	50	27	5.49
Dragon Eye	18	0	1.47	52	7	8.00
Amber Express	24	0	1.20	53	6	5.85
Imai Early	45	4	3.45	90	11	9.63

HARVEST May 13, 1980.

APPENDIX E

MARKET CONSIDERATIONS AND POTENTIALS FOR OVERWINTERED AND EXTENDED SEASON VEGETABLE PRODUCTION IN BRITISH COLUMBIA

prepared by:
R. J. Alcock, Supervisor
Market Research & Analysis
September, 1984

The last few years has seen several growers in the Fraser Valley growing one or more vegetables "over winter" some of which have very good success. Last December the severe cold snap destroyed most of the overwinter broccoli and cauliflower but not virtually everything. Much to my amazement, Jim Conroy informed me his onion and leek trials were not adversely affected and so even in the high risk weather pattern that occurs from time to time, these two crops are certainly encouraging given their demonstrated hardiness. As the production specialists have given you some very positive opportunities to work out, I too would like to point out that the market for several vegetables holds some exciting possibilities if you can meet the challenges.

The crops that I would like to discuss with you this afternoon are cauliflower, broccoli, leeks, carrots, yellow onions, spinach and cabbage.

The factors in marketing these crops that will be discussed are as follows:

1. Potential volumes of the market areas to be served by week and seasonal differences in consumption.
2. Major competing areas of supply to the market to be served.
3. Pricing trends throughout the time periods in which the market is to be supplied.
4. Products quality criterion which is most important to purchasers in the Wholesale trade.

I would like to emphasize that every one of the above criterion is critically important and that if any of these criterion are not well understood, results can be disastrous. Meeting the above challenges however, is a very exciting and rewarding experience and I can honestly say that working with people in the produce business is a great experience too.

CAULIFLOWER

Good interest has been shown in growing overwinter cauliflower and some growers have had very good success in this relatively new venture. Lets look at some of the characteristics of the cauliflower market in British Columbia.

Volumes and consumption

People in British Columbia eat a good volume of cauliflower--approximately 4.5 lbs. per capita annually and this is on a relatively consistent basis throughout the year. It takes 4 to 5 full semi truck loads per week to satisfy the Vancouver wholesale market with fresh cauliflower. Sales of cauliflower have continued to grow but not quite as fast as some other vegetables. As an aside, the most notable increases in sales have been for asparagus, spinach, broccoli, mushrooms, long English cucumbers and peppers.

However, if we consider the overwinter cauliflower market from March through June, a maximum of 140,000 lbs. net/week is required for the Vancouver wholesale market. The strongest volume is in June over the last couple of years.

The major competing area of supply is California, on a year round basis for this crop, but Washington cauliflower growers are into overwintered production, as well, and can be a factor. However, Washington producers usually do not offer product below the landed california price but often their quality is superior over California and sometimes B.C.

Pricing Trends

Cauliflower prices do fluctuate considerably throughout the year. Usually the peaks occur in April before supplies from California come on strong in May. During April 1983, landed import price of California cauliflower actually reached $21.00 but generally a $11.00-14.00 price is more representative of trends during this period. It is a good price for cauliflower and in March and April represents the best pricing over the whole year. Be prepared for a lower prevailing price in May, in the range of $10.00-12.00 per case.

Quality

Good quality cauliflower in the minds of the wholesalers are tight, uniform sized white heads properly trimmed but with green leaves forming a jacket for the head. Generally there is a preference for the larger size cauliflower 9's and 12's but this is not considered, overall, a quality criterion. John Christianson will address produce quality in more detail.

BROCCOLI

Broccoli has truly become the outstanding vegetable in terms of market acceptance during the 1970's. Total Vancouver wholesale sales of broccoli has increased over 2 1/2 fold (250%) from 1974 through 1980 while the population growth in B.C. during these seven years was only 11%. The downturn in the economy and/or possibly other factors have resulted in sales being steady over the past three years with little change during this period from 1981 through present. Nevertheless, in terms of volume sold, broccoli is number eight in sales--only slightly behind cabbage.

Potential Volumes to be Sold

Total broccoli annual volume is about 50% above cauliflower with considerable variation in the consumption between different seasons. Highest sales are between January and May each year when monthly volume is a million to 1.2 million lbs. From June through September, sales fall off to approximately 750,000-800,000 lbs. per month. For the B.C. growers producing broccoli in summer, this is not a good trend, as they quickly reach the saturation point during the traditional shipping season of July through September-October. This results in being able to supply only 18-19% of the total annual requirements. However, for those growers who can successfully produce quality broccoli in the January to June period, tremendous potential exists. Weekly volumes of broccoli during the January to May period are a minimum of 250,000 lbs. which

at 24 lbs/case net weight is over 10,000 cases per week. From a competition point of view, B.C. broccoli growers are in a slightly better position than cauliflower growers, primarily because Washington state production is not quite so significant as a competing factor. Virtually all the competition is from California throughout the whole year.

With regard to price, the landed import price of broccoli from California is generally from $9.50 to $11.00 through the year and there is no indication that the price shows any softening during the first six months, compared to the rest of the year. However, I do want to point out that the pricing of broccoli is rather irregular in B.C. in the July to October periods. B.C. growers often do not price to the landed import cost but rather think, very strongly, that by undercutting other B.C. producers, they will sell more broccoli. California has 40,000 acres in broccoli production so there is always going to be a lot more competition there than other B.C. producers will ever give.

Just a final word about quality. If B.C. producers can produce as good a quality broccoli by overwintering or seasonal extension techniques as in the July to October period, they certainly can compete effectively on this basis. Stalks of broccoli should be tender and firm with compact dark green or purplish green buds in the head. There should be no yellow flowers inside the buds. To

maintain quality, broccoli must be freshly cut, trimmed and iced as soon as possible and maintained at 32°F with relative humidity, 90-95%. A great commodity and opportunity here if you can accomplish the above demands of the market.

LEEKS

For many years, producers of the Lower Mainland Farmers Co-op have successfully produced leeks by overwintering. B.C. producers usually supply 60% of annual requirements and almost 100% of the market demand from May through November. From December to March, the supply is from California and weekly consumption is about 13,000 lbs. per week on the Vancouver wholesale market--a low volume produce item, but nevertheless this item has been good for a few growers, to date.

Similar to broccoli, consumption of leeks is somewhat lower during the periods that B.C. supplies and averages 7,000-10,000 lbs. per week movement on the Vancouver wholesale market. Prices for leeks are very stable at $12.00-13.00/30 lb. case with occasional fluctuations to $14.00-15.00 over the past couple of years. Demand for this item does not appear to be increasing. Because it is an existing overwinter crop in B.C. which does well, it was suggested that growers would be interested in the market for this item. As you can readily see, the only significant potential to supply the B.C. market is the December to May period and since this is a low volume item, little acreage would be required even if their is a economical and practical way of producing leeks during this period.

YELLOW ONIONS

Yellow onions are a high consumption vegetable ranking fourth in terms of tonnage on the Vancouver wholesale market. While onion consumption appears to be declining over the past few years, average monthly volume of yellow onions sold on the Vancouver wholesale market is approximately 1.8 million lbs. per month or 450,000 lbs. per week. Sales of this item do have seasonal patterns and as might be expected, consumption of yellow onions is highest in the September to March period--the cooler season when more stews, etc. are eaten.

British Columbia producers supply the Vancouver wholesale market with yellow onions from late August through February and occasionally, as long as April, and have a 70-80% market share during this period. Some overwintering or fall seeded onions are grown in the South Okanagan and harvested during July. However, these Fall seeded onions are primarily sold on the Okanagan, Calgary and Edmonton markets and as such, the largest imports of yellow onions occur from May to July.

If the May to July market for yellow onions is pursued, the primary source of competition is from Washington and California with some imports from the southern latitudes (Chile and New Zealand) in June. Average weekly volumes of yellow onions still are 350,000 lbs. plus, so there is potential to move a lot of onions during this time.

Pricing

As mentioned, the main competing areas of supply for yellow onions are Washington and California. Over the past few years there has been some dramatic fluctuations in yellow onion pricing from these areas which has been attributable to both export demand and changes in production volumes. However, in considering the onion market from May through August, there generally is a $2.00-3.00 per sack improvement in price over the period from September to March and therefore, unless production and/or storage costs are substantially higher in producing for this period, an excellent opportunity exists for onion growers with the right facilities and management.

CARROTS

Carrots are also a high consumption item with total tonnage almost identical to yellow onions. Carrots are the fifth ranked vegetable in terms of tonnage sold on the Vancouver wholesale market. The sales graphs for topped carrots look very similar to yellow onions with respect to seasonal differences in consumption. That is, carrot sales are strongest over the Fall, Winter and Spring months, particularly in the January to March period.

The main competing area of supply for carrots is California. Washington state is not a major influence on the carrot market in the Pacific Northwest. With regards to B.C.'s market share, only

25-30% is supplied on an annual basis, but during the August through November periods, B.C.'s market share is usually 65% or better. To those who can offer a quality carrot from December onward, a great opportunity exists but it must be a carrot that maintains its quality with an excellent shelf life.

Pricing

Like just about all produce items we have discussed, pricing of California in the Pacific Northwest is largely determined from the supply situation in California. This State has about 23,000 acres of carrots for harvest in the January-June period and an additional 16,000 acres harvested from July to December and produces approximately half of all U.S. carrot production! As a result, pricing for carrots is reasonably steady from season to season. There does appear to be a one dollar per sack premium on the April to June period, but with the constant large production in California, there certainly is not any real price incentive to produce carrots for a particular time frame. However to finish on the positive side, carrots provide the largest tonnage potential for increased growth in B.C., at least 8 to 10 million lbs. which, at 20,000 lbs/acre marketable crop, is 500 acres. This doesn't mean B.C. producers can immediately go and plant another 500 acres. What it does mean is that this is the equivalent consumption the market place demands on a consistent basis of various sizes of high quality carrots between January and June each year.

SPINACH

The last commodity I would like to briefly mention today is spinach. Spinach is a long way down the line in terms of rank in tonnage marketed, but there is really a substantial increase in the demand for spinach. Over the past 5 years, fresh spinach sales on the Vancouver wholesale market has increased by more than 70%! It is used much more extensively in salads, both at restaurants and at home and appears to be growing in popularity as a cooked vegetable as well. Spinach sales on the Vancouver wholesale market are particularly strong during the January to April period. There are two main competing areas of supply--California and (since spinach means big & strong where else other then) Texas.

On an annual basis, B.C. supplies only 15-20% of the total Vancouver wholesale requirements for spinach. During the traditional shipping season from April through September, there still exists for increased production of approximately 100,000 lbs. per month or 25,000 lbs. per week. Total weekly sales of spinach are 100,000-125,000 lbs. per week during the November to April period and somewhat lower at 75,000-90,000 lbs. May through September period.

PRICING

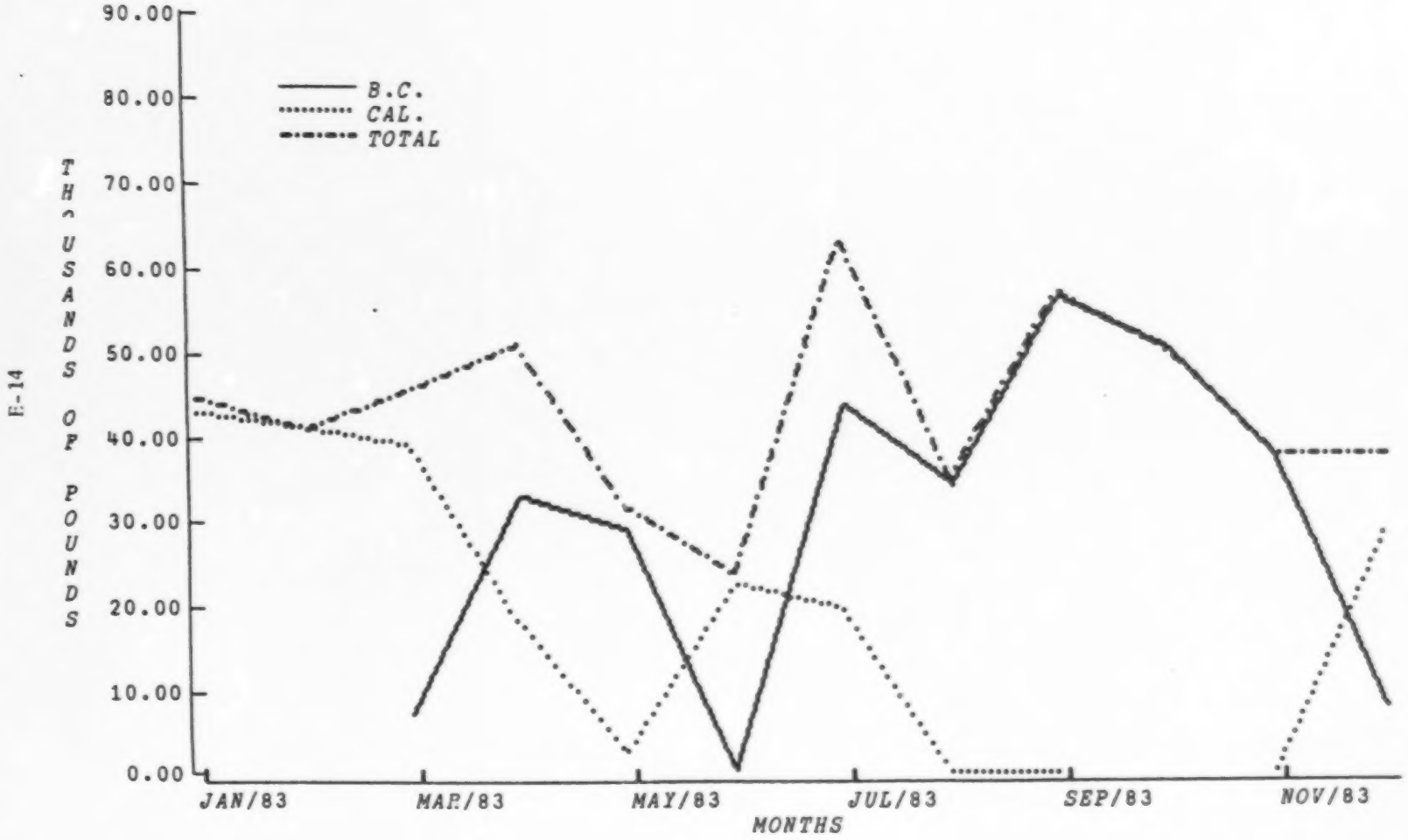
Pricing of spinach has become a little more steady over the past year with the landed import price ranging from $8.00-10.50 for cases of 24 (2 dz. bunches) with the most frequent price $8.50-9.00. The landed import price tends to favour the $9.00-10.00 range from November through March. B.C. Lower Mainland Farmers Co-op, which markets the largest volume of B.C. spinach, has maintained an $8.00/24 bunch price for most of the season and the last few weeks, $9.00. Spinach is sold also in cases of 12/10 oz. cello packages--usually for the same price as bunches of 24. A fair portion of the imported spinach is brought in bulk and packed in the cello packs by local produce wholesalers. Good quality spinach has well developed plants with clean dark green colour and shows no signs of wilt, yellow or sliminess. Spinach has this plus of being on the rise in consumption and presents some further opportunities for B.C. vegetable growers to consider.

Finally in closing, the road to success is determined by competing in quality, price and service of which all three must be more vigorously pursued than ever to meet the needs of the most discerning population in history.

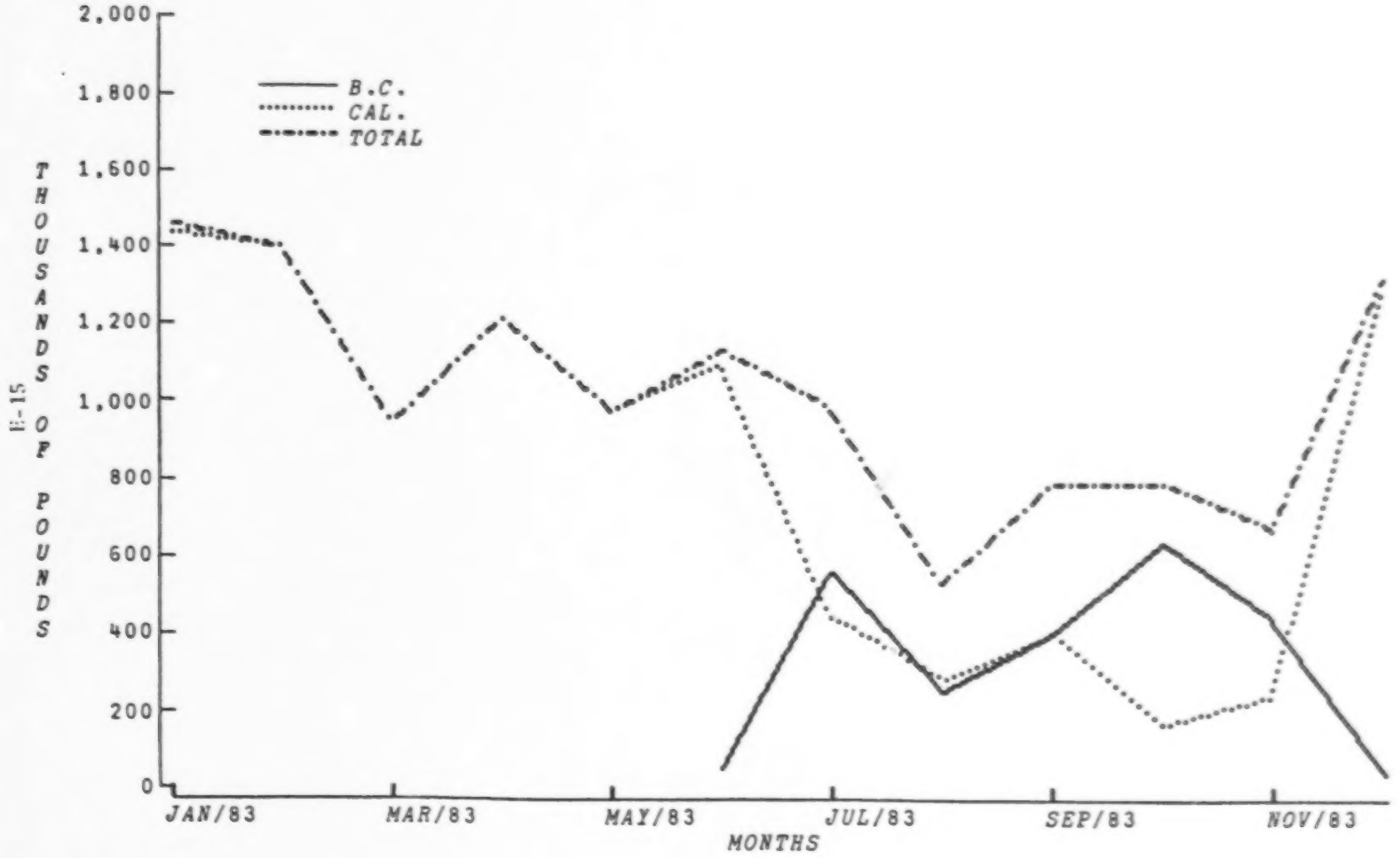
RANK OF HIGHEST VOLUME VEGETABLE UNLOADS TO THE VANCOUVER WHOLESALE MARKET

RANK	COMMODITY	1983 VOLUME	PERCENT SUPPLIED BY B.C.	1982 VOLUME	PERCENT SUPPLIED BY B.C.	1981 VOLUME	1980 VOLUME	1979 VOLUME
1	Potatoes	115,332	54	120,035	44	119,018	124,016	125,041
2	Lettuce-iceberg	43,553	29	43,795	25	45,014	48,169	47,918
	-fancy	5,400	76	5,094	N/A	4,780	4,322	4,403
3	Tomatoes-field	26,368	N/A	26,109	N/A	31,489	28,355	29,871
	-greenhouse	4,793	9	4,179		3,617	3,570	3,929
4	Onions-yellow	20,734	47	24,680	37	25,372	27,368	27,768
	-green	5,066		5,024		5,026	4,850	4,497
5	Carrots-topped	20,245	27	23,639	25	22,070	22,357	20,448
	-bunch	2,292		2,564		2,313	1,104	1,270
6	Celery	18,898	33	19,335	30	20,458	20,423	20,253
7	Cabbage-green	12,517	61	13,243	57	13,432	14,171	13,826
8	Broccoli	12,042	18	12,511	19	12,028	13,393	12,231
9	Mushrooms	10,471	100	8,987	100	8,828	8,080	7,239
10	Cukes-long English	8,485	85	7,203	87	5,697	5,545	5,327
11	Peppers	8,401	.2	8,265	---	7,840	7,937	
12	Cauliflower	8,037	26	8,237	29	8,292	8,152	7,370
13	Corn	7,173	29	8,453	28	6,938	6,407	7,228
14	Green Onion	5,066	27	5,024	25	5,026	4,850	4,497
15	Radishes	3,202	50	3,057	41	3,221	3,091	2,879
16	Spinach	4,444	18	4,160	15	4,101	3,497	2,577

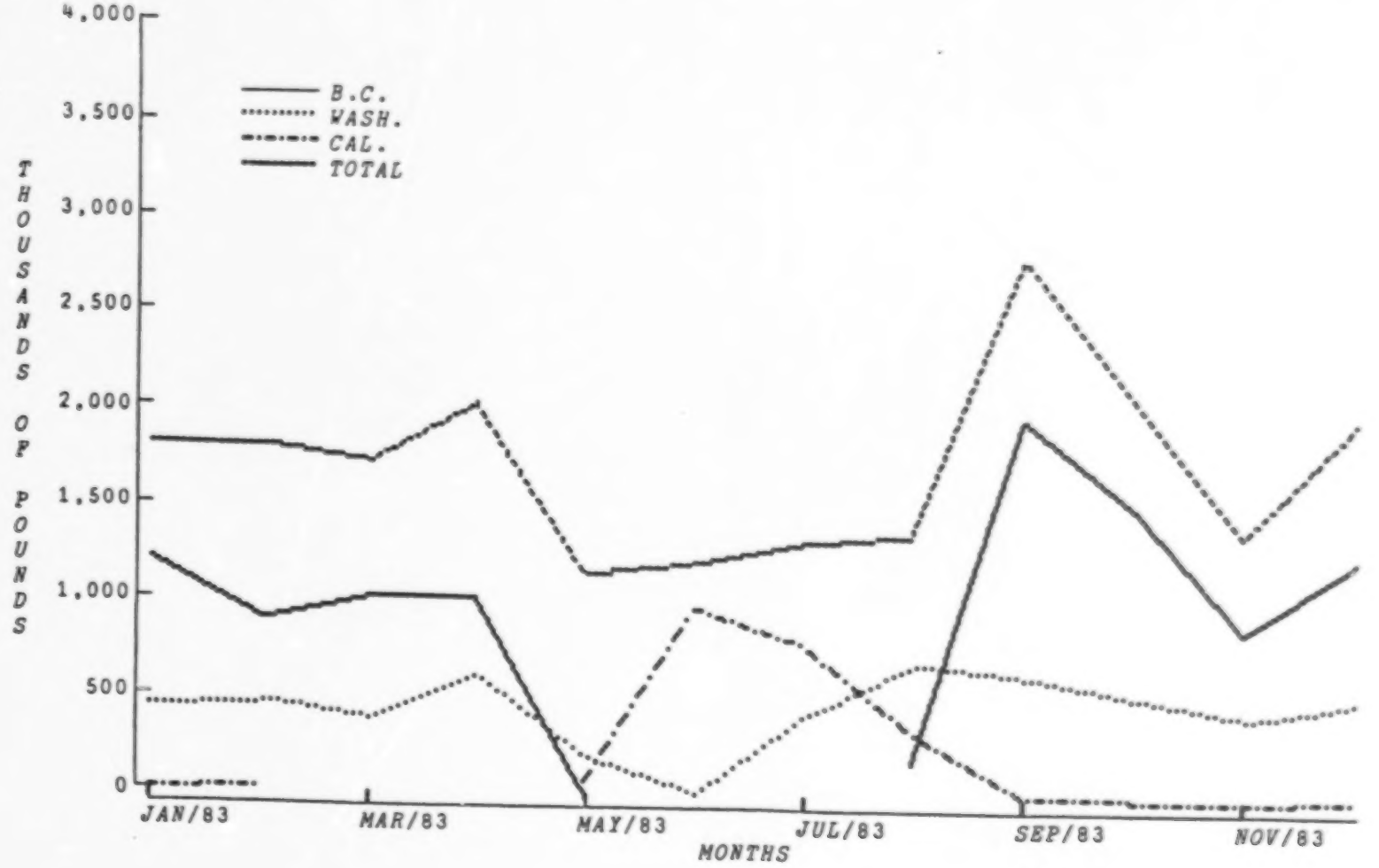
UNLOADS OF LEEKS TO THE VANCOUVER WHOLESALE MARKET
BY SOURCE
FOR 1983



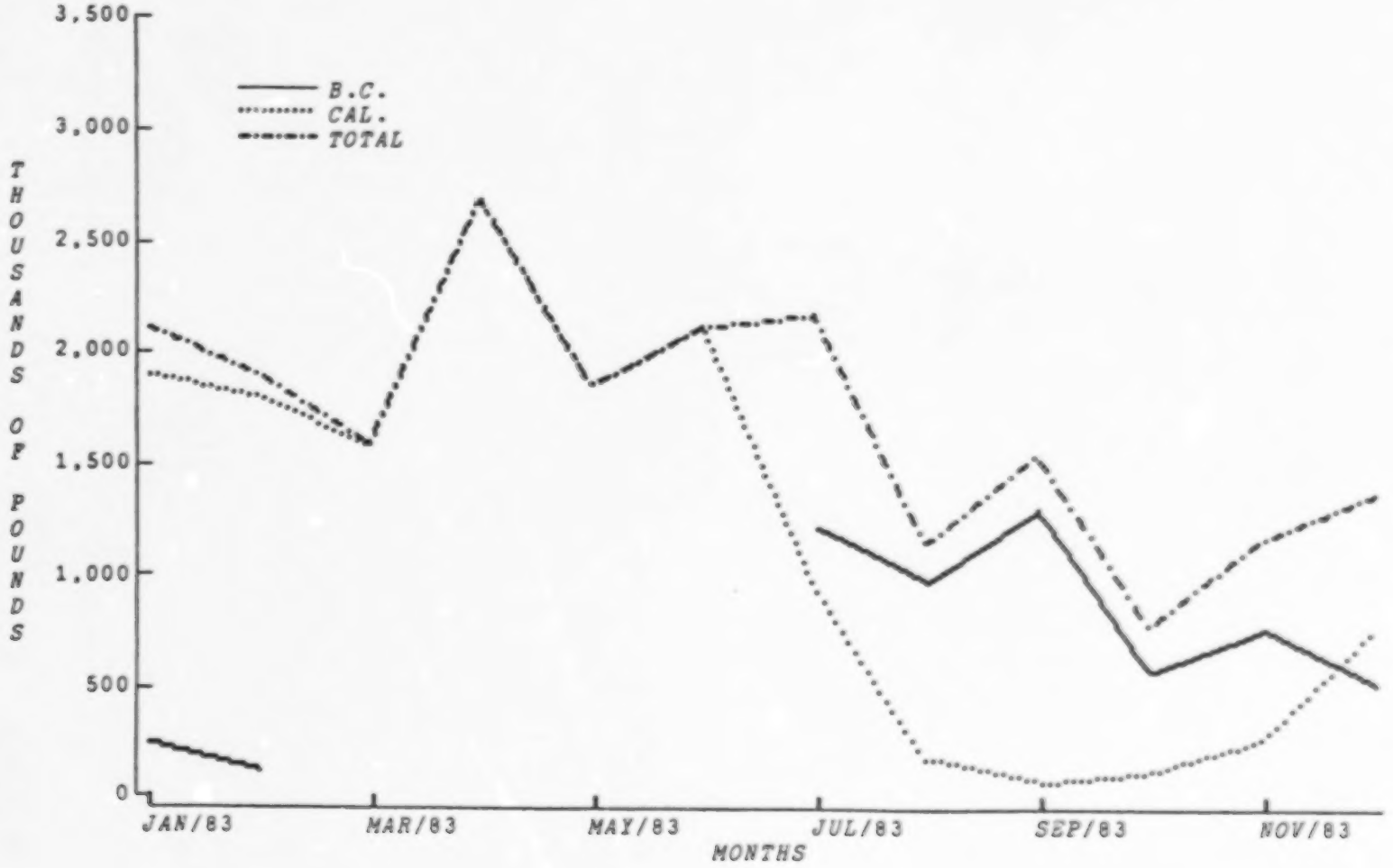
BROCCOLI UNLOADS TO THE VANCOUVER WHOLESALE MARKET
BY SOURCE



YELLOW ONION UNLOADS TO THE VANCOUVER WHOLESALE MARKET
BY SOURCE
FOR 1983



TOPPED CARROT UNLOADS TO THE VANCOUVER WHOLESALE MARKET
BY SOURCE
FOR 1983



SPINACH UNLOADS TO THE VANCOUVER WHOLESALE MARKET
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FOR 1983